Villari's strained disk and Lüdtge's strained prism. The disk was free from strain in the middle, the prism free from strain at the ends.

I have repeated Villari's experiment at the Cavendish Laboratory, using, at Mr. Glazebrook's suggestion, an elliptic analyser to determine the magnetic rotation. With the disk spinning about 200 times a second, the magnetic rotation was reduced from 10° to 6°. This is not so great a diminution as Villari observed, but his glass may have been softer and more easily strained.

Villari thought that the effect he observed was due to the time required to magnetise the glass. That this supposition was erroneous has been clearly established by the experiments of Bichat and Blondlot, recently repeated by Dr. Lodge. In these experiments the oscillating discharge of a Leyden jar was found to rotate the plane of polarisation in time with the oscillations. Before hearing of these results I had myself attacked the problem in a somewhat similar manner. A coil of wire was wound round a piece of heavy glass, and a current alternated 250 times a second by a tuning-fork was sent through the coil. The current was measured by a dynamometer and a tangent galvanometer. The first gave the measure of the current independently of its sign, the second showed that the integral current was zero. When the current was passing it was found impossible to extinguish the light, owing to the rapid alternations of the plane of polarisation.

In conclusion, I have to express my thanks to Professor Thomson and Mr. Glazebrook for many kind suggestions and encouragement, and especially to Professor Thomson for the privilege of using the Cavendish Laboratory.

II. "Revision of the Atomic Weight of Gold." By J. W. Mallet, F.R.S., Professor of Chemistry in the University of Virginia. Received April 15, 1889.

(Abstract.)

After noticing and giving the results of the earlier determinations of the atomic weight of gold, and the recent researches of Krüss and of Thorpe and Laurie, the author reports upon experiments of his own in the same direction, which have occupied much of his time and labour for the last three or four years.

The difficulties connected with the accurate determination of the atomic weight of this metal are remarked upon, and the general principles are reviewed which ought to be observed in all investigations of this kind.

The means and methods of weighing used are stated, and the pre-

cautions are described in detail which were resorted to in purifying the metallic gold to be employed in the research, with the history of some samples of "proof" and "trial plate" gold, obtained from the Mint establishments of the United States and England. The general precautions observed in the course of the work are described, particularly the use of an arrangement for evaporating some of the gold solutions with exclusion of the organic matter of atmospheric dust.

A detailed account is given of the methods adopted in seven series of experiments, looking to more or less independent determinations of the atomic weight sought, viz.:—

First Series.—Division of a uniform neutral solution in water of auric chloride into two accurately weighed and nearly equal portions; precipitation from the one portion by sulphur dioxide of metallic gold, which was collected and weighed; determination, with special precautions, of the quantity of metallic silver required, as nitrate, to precipitate the chlorine in the other portion.

Second Series.—Similar treatment of a neutral solution of auric bromide, giving the quantity of gold in one portion, and the quantity of silver required to precipitate bromine in the other portion.

Third Series.—Similar treatment of a solution of repeatedly crystallised potassium auri-bromide, again giving the quantity of gold in one portion, and the silver equivalent to the whole of the bromine in the other portion.

Fourth Series.—Determination of the loss by ignition of a weighed quantity of trimethyl-ammonium auri-chloride.

Fifth Series.—Comparison of the weights of gold and silver simultaneously deposited by the same electric current from aqueous solutions of auro-cyanide and argento-cyanide of potassium respectively.

Sixth Series.—Comparison of the weight of gold deposited from a solution of potassium auro-cyanide on electrolysis with the volume of hydrogen liberated by the same current from dilute sulphuric acid, the hydrogen evolved in a voltameter of special construction, and measured of course under well-defined conditions of temperature and pressure.

Seventh Series.—Determination of the volume of hydrogen, under known conditions of temperature and pressure, obtainable by solution in dilute sulphuric acid of a given quantity of specially purified metallic zinc; use of a definite quantity of the same zinc, taken in small excess, to precipitate gold from a neutral solution of auric chloride, and determination of the quantity of metallic gold thrown down; determination of the volume of hydrogen obtainable on solution in dilute sulphuric acid of the *excess* of zinc thus used. Resulting comparison of the quantity of gold in solution as auric chloride with the quantity of hydrogen equivalent to the metal.

The results obtained are then stated as follows:—

	Atomic weight of gold.		
	Average value from aggregate weights.	Lowest value from a single experiment.	Highest value from a single experiment.
First series (5 experiments)	196·722	196·688	196·770
Second „ (6 „)	196·790	196·731	196·843
Third „ (4 „)	196·775	196·685	196·817
Fourth „ (5 „)	197·225	197·131	197·289
Fifth „ (5 „)	196·823	196·709	196·945
Sixth „ (3 „)	197·137	196·994	197·283
Seventh „ (6 „)	196·897	196·848	196·956

If the general mean be taken of the results of all these series of experiments, using the average value derived from each, and giving all an equal weight, the number 196·910 is obtained for the atomic weight of gold.

But reasons are given for feeling much less confidence in the results of the fifth and sixth series of experiments (made by electrolysis) than in the rest; if these two series be excluded the general mean becomes 196·882.

A certain degree of suspicion as to possible constant error having been shown to perhaps affect the results of the fourth series, if this also be left out, and only the first three and the seventh series be considered, the general mean will be 196·796.

And finally, if, for the sake of comparison with the results of the recent researches of other chemists, only the first three series be included, in which auric chloride and bromide were examined, the general mean will be 196·762—a result rather higher than that of Krüss and lower than that of Thorpe and Laurie, but nearer to the latter than the former.

In conclusion, reference is made to the bearing of the results reached on Mendelejeff's periodic classification of the elements, and on the hypothesis of Prout, and attention is drawn to the desirability of a general re-examination of atomic weights, not by a single method only in each case, or by methods more or less nearly similar or dependent on each other, resting satisfied with a close agreement of results under these conditions, but by as many distinct and independent methods as may be possible for each element examined.